Remarks

In the outstanding Official Action, the Examiner:

(1) rejected claims 1, 3, 4, 11, 12 and 19 under 35 USC 102(b) as being anticipated by Paradies (U.S. Patent No. 4,870,174) ("Paradies");

(2) rejected claims 1, 3, 4, 11-15 and 19 under 35 USC 102(b) as being anticipated by Short et al. (U.S. Patent No. 5,578,119) ("Short");

(3) rejected claims 1, 3, 4, 6, 7 and 19 under 35 USC 102(e) as being anticipated by Eini et al. (U.S. Patent Application Publication No. 2004/0253275) ("Eini");

(4) rejected claims 1, 3, 4, 6, 7, 13 and 19 under 35 USC 102(b) as being anticipated by Chen et al. (U.S. Patent Application Publication No. 2003/0157178) ("Chen");

(5) rejected claims 1, 3-5, 11, 13-15 and 19 under 35 USC 102(b) as being anticipated by Luissi et al. (U.S. Patent No. 4,587,284) ("Luissi");

(6) rejected claims 1, 3, 4, 6, 13-15 and 19 under 35 USC 102(b) as being anticipated by Marchant et al. (U.S. Patent No. 6,297,337) ("Marchant");

(7) rejected claims 1, 3-5, 11-15 and 19 under 35 USC 102(b) as being anticipated by Wokalek et al. (U.S. Patent No. 4,905,700) ("Wokalek");

(8) rejected claims 1, 3, 6, 7, 11-15 and 19 under 35 USC 102(e) as being anticipated by Young et al. (U.S. Patent Publication No. 2003/0180347) ("Young"); and

(9) rejected claims 1, 3-5 and 19 under 35 USC 102(b) as being anticipated by Pfirrmann et al. (International Publication No. WO 94/03174) ("Pfirrmann").

With respect to Items 1-9 above, Applicant has now amended claim 1 in order to further define the present invention and further distinguish it from the prior art. On account of the foregoing changes and the following remarks, Applicant respectfully submits that this application is in condition for allowance and respectfully requests reconsideration.

The claims currently under active prosecution in this case consist of claims 1, 3-7, 11-15 and 19. Claim 1 is independent, and claims 3-7, 11-15 and 19 all depend, either directly or indirectly, from claim 1. Therefore, the limitations of claim 1 are present in all of the claims currently under active prosecution in this case.

Claim 1 currently reads as follows:

A catheter lock comprising:

a thixotropic gel; and

an antimicrobial agent contained in the thixotropic gel, the antimicrobial agent being present in the thixotropic gel in sufficient concentration as to render the catheter lock antimicrobial;

wherein the thixotropic gel and the antimicrobial agent are selected and combined such that the catheter lock:

flows freely upon the application of a threshold level force imparted by a conventional medical syringe so that the catheter lock is (i) instillable into a hemodialysis catheter using a conventional medical syringe in order to completely fill the hemodialysis catheter, and (ii) easily withdrawable from the hemodialysis catheter using a conventional medical syringe;

is sufficiently cohesive that, when the catheter lock moves through the lumen of a hemodialysis catheter, the catheter lock advances through the lumen as a cohesive rod-shaped mass;

when a hemodialysis catheter is installed in the vascular system of a patient and the catheter lock fills the lumen of the hemodialysis catheter, the catheter lock remains in the lumen of the hemodialysis catheter; and

is biocompatible and biodegradable in blood.

Thus, claim 1 calls for a catheter lock which comprises a thixotropic gel and an antimicrobial agent contained in the thixotropic gel, wherein the thixotropic gel and the antimicrobial agent are selected and combined such that the catheter lock:

(1) flows freely upon the application of a threshold level force imparted by a conventional medical syringe so that the catheter lock is (i) instillable into a hemodialysis catheter using a conventional medical syringe in order to completely fill the hemodialysis catheter, and (ii) easily withdrawable from the hemodialysis catheter using a conventional medical syringe (sometimes hereinafter referred to as the "syringability" attribute);

(2) is sufficiently cohesive that, when the catheter lock moves through the lumen of a hemodialysis catheter, the catheter lock advances through the lumen as a cohesive rod-shaped mass (sometimes hereinafter referred to as the "plug flow" attribute);

(3) when a hemodialysis catheter is installed in the vascular system of a patient and the catheter lock fills the lumen of the hemodialysis catheter, the catheter lock remains in the lumen of the hemodialysis catheter (sometimes hereinafter referred to as the "lock integrity" attribute);

(4) the catheter lock is biocompatible (sometimes hereinafter referred to as the "biocompatibility" attribute); and

(5) the catheter lock is biodegradable in blood (sometimes hereinafter referred to as the "biodegradability" attribute).

None of the nine references cited by the Examiner contains all of the foregoing limitations recited in claim - which is to be expected, since these limitations are specifically chosen so as to provide a catheter lock, and none of the references were designed for a similar application. Furthermore, while the references teach a gel, none of the references cited by the Examiner disclose a catheter lock comprising a thixotropic gel and an antimicrobial agent, wherein the thixotropic gel and the antimicrobial agent are selected and combined such that the catheter lock (1) flows freely upon the application of a threshold level force imparted by a conventional medical syringe so that the catheter lock is (i) instillable into a hemodialysis catheter using a conventional medical syringe in order to completely fill the hemodialysis catheter, and (ii) easily withdrawable from the hemodialysis catheter using a conventional medical syringe; (2) is sufficiently cohesive that, when the catheter lock moves through the lumen of a hemodialysis catheter, the catheter lock advances through the lumen as a cohesive rod-

shaped mass; (3) when a hemodialysis catheter is installed in the vascular system of a patient and the catheter lock fills the lumen of the hemodialysis catheter, the catheter lock remains in the lumen of the hemodialysis catheter; and (4) is biocompatible and biodegradable in blood.

Specifically, Paradies teaches specific types of compounds which can be used as pharmaceuticals. Paradies does not disclose a catheter lock which flows freely under the forces imparted by a conventional medical syringe, moves through a catheter as a cohesive rod-shaped mass, and remains in the lumen of a catheter when installed in the vascular system of a patient. Thus, Paradies does not teach a catheter lock having the "syringability", "plug flow" and "lock integrity" attributes discussed above. Furthermore, Paradies does not teach a catheter lock which is biodegradable in blood, i.e., Paradies does not teach the "biodegradability" attribute discussed above. For these reasons, Paradies is not believed to disclose or render obvious the present invention.

Short describes the material properties of a sculpting medium (i.e., something like clay). Short notes that the material can be formed so that it does not exhibit elastic memory (see column 7, line 20). This means that the Short material does

not exhibit "die swell" characteristics, which is essential if the material is to pass through the narrow tip of a syringe and then expand or spring back so as to fill the catheter. This is important, since the catheter lock must contact the side walls, thereby enabling "lock integrity". Thus, Short does not teach a catheter lock having the "syringability" attribute discussed above. Furthermore, Short does not disclose the "lock integrity" attribute discussed above. Finally, Applicant questions whether Short teaches a material which has the "biocompatibility" and "biodegradability" attributes discussed above. For these reasons, Short is not believed to disclose or render obvious the present invention.

Eini teaches a viscoelastic material which is semi-solid at rest but exhibits liquid properties upon application of shear forces. However, Eini does not disclose that the material is instillable into, and withdrawable from, a hemodialysis catheter using a conventional medical syringe. Also, Eini makes no mention of die swell which, as discussed above, is essential if the catheter lock is to pass through the narrow tip of a syringe and then expand to fill a catheter and thereby enable "lock integrity". Thus, there is no reason to believe that Eini teaches a catheter lock which has the "syringability", "plug

flow" or "lock integrity" attributes discussed above. Furthermore, Eini mentions at [0062] - [0065] that fatty substances are preferred embodiments, which may not allow dissolution in the bloodstream. Thus, there is also no reason to believe that Eini teaches a material which has the "biodegradability" attribute discussed above. For these reasons, Eini is not believed to disclose or render obvious the present invention.

Chen describes methods and properties to make specific biocompatible thixotropic gels which can be drug carriers and injected with a syringe into patients. Chen further discloses the characteristics needed to enable one to inject the gel into subjects. However, Chen makes no mention of many critical aspects of the present invention, such as the die swell, plug flow and yield strength needed for the "syringability", "plug flow" and "lock integrity" attributes discussed above. More particularly, Chen describes viscosity ranges suitable for injection from a special Hamilton Syringe (i.e., a long, thin laboratory syringe having a construction different from a conventional medical syringe and producing pressures three to four times that obtained with a conventional medical syringe) into a short needle. Chen makes no mention of withdrawing the

catheter lock back into the syringe, and certainly not in the context of withdrawing the catheter lock back through a long catheter of the sort used in hemodialysis applications. Although the viscosity values described by Chen are acceptable for injection, they are not acceptable for the suction withdrawal of the catheter lock. In this respect it should be appreciated that, during injection with a conventional medical syringe, one can produce pressure levels of 3 to 4 atmospheres (i.e., up to approximately 3000 mm Hg pressure). However, a syringe in "sucking" mode can theoretically produce a pure vacuum which only allows a driving pressure of 1 atmosphere (i.e., 760 mmHg). In reality, the driving pressure of a "sucking syringe" is much lower than a pure vacuum, primarily because air and water vapor and other gases dissolved in the gel come out of solution and, as these gases stay in the expanded space of the syringe during suction, do not allow one to reach a perfect vacuum. Applicant has run experiments showing that gels being sucked into a small syringe usually have pressures which produce a suction pressure difference of approximately 500 mm Hg or even less. This is, then, the worst case condition regarding the ability to move a gel with a "sucking" syringe in order to overcome the yield strength and start gel movement and enable reductions in viscous

drag (thixotropic characteristic) so as to enable easy gel movement. For these reasons, it is believed that Chen does not disclose a catheter lock having the "syringability", "plug flow" and "lock integrity" attributes discussed above. Furthermore, Figs. 5, 6A and 6B of Chen suggest that the dissolution rate of the Chen gels is much too slow for Applicant's gel requirements, as it must dissolve in a matter of hours at most (rather than weeks). Thus, Chen also does not disclose a catheter lock having the "biodegradablility" attributes discussed above. For these reasons, Chen is not believed to disclose or render obvious the present invention.

Luissi describes a gel drug carrier, but does not describe a thixotropic gel. Thus, Luissi does not disclose a catheter lock having thixotropic gel and an antimicrobial agent contained therein. Furthermore, Luissi does not disclose the "syringability", "plug flow" and "lock integrity" attributes discussed above. For these reasons, Luissi is not believed to disclose or render obvious the present invention.

Marchant teaches how to formulate a polymer so as to provide selected rheological properties (e.g., a particular yield stress value, or a Brookfield viscosity value, or a microviscosity value, etc.). However, this is not the same as teaching

Applicant's claimed catheter lock. Applicant's claimed catheter lock simultaneously provides five different attributes, i.e., the aforementioned "syringability", "plug flow", "lock integrity", "biocompatibility" and "biodegradability" attributes. Nowhere does Marchant teach a specific formulation which simultaneously provides all five of these attributes, nor does Marchant provide any motivation for doing so, inasmuch as Marchant is concerned with providing a new polymer formulation for use as bioadhesive, thickener, emulsifier, suspending aids and pharmaceutically controlled release excipients, rather than providing a catheter lock. For these reasons, Marchant is not believed to disclose or render obvious the present invention.

Wokalek does not teach a thixotropic gel, much less a catheter lock having the aforementioned "syringability", "plug flow", "lock integrity", "biocompatibility" and "biodegradability" attributes. The Wokalek composition appears to be a soft, solid-like sheet of material, intended primarily to facilitate ultrasound transmission, and does not appear to be flowable. For these reasons, Wokalek is not believed to disclose or render obvious the present invention.

Young discloses an adhesive bandage-like pad comprising a hydrogel matrix to deliver a drug through the skin. Young fails

to disclose a thixotropic gel. Furthermore, Young fails to disclose a catheter lock with the specific rheological properties of the sort which are critical to the present invention, i.e., the aforementioned "syringability", "plug flow" and "lock integrity" attributes. Furthermore, Young is not believed to teach the "biodegradability" attribute of the present invention. For these reasons, Young is not believed to disclose or render obvious the present invention.

Pfirrmann discloses methods for using taurolidine compositions for dental applications. Pfirrmann notes that the taurolidine compositions may be a gel which can be injected with a syringe (see page 8, 2nd complete paragraph). However, Pfirrmann fails to mention gel yield strength, that the gel has a viscosity low enough to allow removal with a syringe, die swell, plug flow, etc. One hydroxycellose gel is described on the bottom of page 9 to the top of page 10, but there is no description of specific properties called for in the catheter lock of claim 1. Applicant notes that a commercial hydroxycellulose taurolidine gel made by TauroPharm for dental use has no yield strength, and hence no "lock integrity". Thus, Pfirrmann does not appear to teach the aforementioned "syringability", "plug flow" and "lock integrity" attributes of

the present invention. For these reasons, Pfirrmann is not believed to disclose or render obvious the present invention.

On account of the foregoing, Applicant submits that claims 1, 3-7 and 11-15 and 19 are in condition for allowance. Early and favorable reconsideration is therefore respectfully requested.

Thank you.

Respectfully submitted,

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